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with the best regards  
The Author  
(13)

FOUR CASES  
OF  
ANEURISM OF THE ARCH OF THE AORTA,  
AND A  
CASE OF DIAPHRAGMATIC HERNIA.\*

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I HAVE had occasion, within the last eighteen months, to inspect in the Royal Infirmary the bodies of nine individuals who died from aneurism within the thorax, and I have drawn up accounts of the morbid appearances observed. Four of these cases, from the rarity of their termination, appear to me to be of sufficient interest to be considered contributions to the morbid anatomy of aneurism of the arch of the aorta, and will be found in the following pages nearly in the same form, with the exception of a few verbal corrections, as I have entered them in the Registers of Dissections kept in the Infirmary. Of the five cases not detailed here, in one, the aneurism was placed upon the middle part of the

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thoracic portion of the aorta, and burst into the œsophagus ; a second was placed upon the lower part of the thoracic and upper part of the abdominal aorta, and burst into the left cavity of the pleura ; in a third, the aneurism was placed upon the transverse portion of the arch of the aorta, had destroyed by its pressure the continuity of the left recurrent nerve, and produced sudden suffocation by its effects upon the movements of the muscles attached to the arytenoid cartilages of the larynx ; in a fourth, the aneurism occupied the upper part of the descending portion of the arch, and proved fatal by its pressure upon the trachea and left recurrent nerve ; in the fifth, the aneurism was placed upon the trunk of the *arteria innominata*. at its origin, had acquired an immense size, extending upwards as high as the thyroid cartilage of the larynx, and produced absorption of the upper part of the sternum, and of the inner end of the right clavicle. The skin had become livid at two places over the surface of the tumour, the blood had even begun to ooze out, but he died before any external rupture had occurred.

CASE I.—*Aneurism of the Aorta opening into the Right Auricle*.—E. W. aged 35, a tinsmith, and addicted to the use of ardent spirits, was admitted, 5th October 1839, under the charge of Dr Peebles. Stated that he had been long subject to fits of palpitation, but dates his present complaints from an uneasy sensation, like something giving way, which he felt in his chest while raising a heavy weight about three weeks before admission. On admission, the arms and chest, but more especially the face and neck, were of a livid colour, very much swollen, and pitted on pressure, and the vessels of the conjunctiva were congested with blood. The lower parts of the body were not œdematous. He had much dyspnœa, and some cough. Strong impulse of heart, and its apex was felt lower than usual ; and a double bellows sound was very audible over the cardiac and sternal regions, particularly over the upper part of the latter. The bruit accompanying the first sound of the heart was more prolonged ; the bruit accompanying the second sound was sharper and shorter. The chest could not be satisfactorily percussed from the great œdema ; but there was evident extended dulness over the cardiac region, and over the upper part of the sternum. The respiratory murmur was very loud at the upper angle of the scapula. He had some difficulty in deglutition ; pulse 90, with a distinct interval between the impulse felt at the chest, and the beat at the wrist ; urine scanty and turbid, not coagulable by heat or nitric acid. Had been previously bled, cupped, and had used diuretics and drastic purgatives. Both previous to and after his admission, his intellectual faculties were confused, and his speech was ultimately impaired. It appears, from information furnished by the medical gentleman who attended him previous to his ad-

mission, that the lividity, œdema of upper part of body, and confusion of the intellectual faculties, occurred about the same time. On his admission the diagnosis was hypertrophy of the left side of heart, and aneurism of the aorta, and he was treated by drastic purgatives and digitalis. The œdema and lividity of upper part of body continued, and the dyspnœa became more urgent, and he was unable to assume the horizontal posture for any length of time. No œdema of lower part of body presented itself, except some slight swelling of serotum. Some dark, circumscribed livid spots appeared on chest. He had delirium at night, and his eyes were bloodshot. Pulse ranged from 90 to 100. He died suddenly on the morning of the 13th.

*Sectio Cadaveris, 16th.*—The difficulty of prevailing upon the friends to permit an inspection of the body will explain its delay. Forty-four ounces of serum were effused into the cavity of the right pleura, and thirty-six into the left. Lungs small, compressed by the serous effusion into the chest. They contained a considerable quantity of blood and frothy serum, but were everywhere spongy. The inner surfaces of the serous part of the pericardium were universally and firmly adherent, and the heart was decidedly larger than usual. The left ventricle was evidently somewhat dilated, while the other cavities of the heart were of their usual size. The walls of all the cavities of the heart were considerably thickened, as will appear from the following measurement. Thickest part of right auricle 4–24ths, and thickest part of left 5–24ths of an inch; thickest part of right ventricle, 9–24th, (measured where no *columnæ carneæ* were present;) thickest part of left ventricle, 18–24ths; thickness of middle part, 15–24ths; and of apex, 6–24ths. The walls of the heart were paler and more flabby than usual. The aortic and semilunar valves, and the other valves of the heart were healthy, and found adequate when tested by water. The aorta at its origin suddenly dilated, and formed an aneurismatic enlargement capable of easily containing the closed fist. This dilatation was confined to that part of the artery immediately above the aortic opening, termed the sinuses of Valsalva, and as the circumference was placed on a lower plane than the centre, the aortic opening, with its semilunar valves, was situated on the most elevated part of the floor of the aneurismatic swelling. The tendinous portions of the aortic opening were very much thickened, and somewhat elongated upwards; but the aortic orifice was not enlarged. The fibres of the middle coat of the artery which pass between the three projecting extremities of the tendinous festoons, and form the upper termination of the sinuses of Valsalva, were much elongated, and carried considerably upwards at the middle part, so that the upper boundary of the aneurism was bounded by three large segments

of a circle, formed by these three bands of fibres. The ascending portion of the arch of the aorta suddenly resumed its original size, and there was a portion of the vessel 1 inch and 4-12ths in length, between the upper edge of the dilated part, and the origin of the *arteria innominata*, of its usual size and appearance, with the exception of being somewhat thickened and roughened on the inner surface. The aneurismatic dilatation chiefly projected backwards and to the right side, pressing upon the anterior edge of the *septum auricularum*, and the neighbouring parts of both auricles, and overlapping and pressing upon the anterior and left part of the right auricle, and stretching the termination of the descending cava over its outer surface. On examining the interior of the auricles and the aneurism, two oval openings, with defined and rounded margins, (one of which was 10-24ths of an inch in length, and 5-24ths in breadth; the other 9-24ths in length, and 5-24th in breadth,) were observed forming a free communication between the aneurism, the right auricle, and the termination of the superior cava. The cava itself was pervious, but must have been compressed by the aneurism when distended with blood. On the inner surface of the anterior wall of the left auricle, near the anterior edge of the septum, there was a dark projecting part about the size of the point of the finger, which, from the pressure of the aneurism upon it, and the thinning of the walls of the auricle at that part, would soon have given way, and have formed a communication between the left auricle and the aneurism. On examining the inner surface of the aneurism, it was observed that the dilated coats of the vessel were thin and very soft, that they were deficient at some points, and that the sac of the aneurism was there formed by the adherent pericardium, or by the outer surface of the walls of the auricles. The blood was fluid, and there were no fibrinous clots in the aneurism. Abdominal organs healthy. Brain not permitted to be examined.

The old and firm adhesions between the inner surfaces of the serous part of the pericardium satisfactorily explains the unusual size of the aneurism in this patient. It is well known that, when an aneurism forms upon an artery, the internal and middle coats in general soon give way, and the aneurismal sac is then formed by the surrounding cellular tissue. When an artery is surrounded by very little cellular tissue, as is the case with that portion of the aorta enclosed within the pericardium, and with the arteries within the cranium, aneurisms formed upon it seldom acquire a large size; and there can be no doubt, from the appearances observed on dissection in this patient, that the aneurism would have burst into the cavity of the pericardium, and have soon arrested the heart's action at some period previous to the time of his death, and probably before it had burst into the auricle, had it not been for the



old adhesions between the inner surfaces of the serous part of the pericardium. The greater thinness of the middle coat, and the larger calibre of the artery at the sinuses of Valsalva, account, as we have elsewhere explained,\* for the greater liability of that part of the vessel to be affected with aneurism.

The sensation of something giving way in the chest felt by the patient on lifting a heavy weight, and the train of symptoms which followed, may be referred to some sudden increase of the size of the aneurism; and it is probable that at this time also the aneurism burst into the right auricle. The compression of the *cava superior* at its termination satisfactorily explains some of the most striking symptoms of this case. It explains the great œdema and lividity of the upper part of the body, the congested state of the vessels of the conjunctiva; and, conjoined with the dyspnœa, will also account for the disturbance of the intellectual faculties. It also explains in a very satisfactory manner the effusion of serum into the chest, when none was effused into the abdomen; for as the *vena azygos*, which returns the blood from the inner surface of the parietes of the chest, enters the *cava superior* above the point compressed, the same impediment must have existed to the return of the blood from that vein, as from the other branches of the *cava superior*. If the compression of the *cava superior* had occurred in a more gradual manner, as probably took place in a case of complete obliteration of this vein, which we have elsewhere detailed,† it is possible that the collateral circulation with the *cava inferior* might have been established without any such derangement of the circulation of the upper part of the body having manifested itself. Though all cases of compression of the *cava superior* are not attended by the same effects upon the circulation, yet at the same time it must be admitted, that, if similar marked symptoms of retardation of the blood in the vessels of the head and superior extremities with œdema, and the effusion of fluid into both sides of the chest, while the lower parts of the body remained unaffected, were presenting themselves, we would be justified in predicting that the *cava superior* would be found compressed.

CASE II.—*Aneurism of the Aorta bursting into the Pulmonary Artery*.—J. H. aged 36, of intemperate habits, was admitted on the 22d of May 1839 into the Royal Infirmary, under the charge of Professor Alison. Stated that in January last he began to feel occasional palpitations with dyspnœa, and underwent some medical treatment without relief. About a fortnight before admission, œdema of feet had commenced, and had continued to

\* Article Heart, Cyclopædia of Anatomy and Physiology, Vol. ii.

† No. 122 of this Journal.

increase. On admission, the lips and face were pale. Had severe cough and considerable dyspnœa, and much œdematous swelling of the feet and ankles; and also much enlargement of abdomen. There was considerable dulness on percussion over the cardiac region, and also over the lower part of the left scapula. The heart's action was irregular in force, and a bruit accompanied both sounds, but particularly the second, which was prolonged. The respiration was rather faint in the lower part of both sides of chest, and was accompanied with subcrepitating râle; pulse small and weak; has occasional vomiting and sense of constriction in the epigastric region; micturition scanty, and frequent; urine coagulable by heat and nitric acid; bowels costive. Took diuretics and antispasmodics without much relief to the symptoms. On the 5th June it is reported that he feels occasionally as if he were going to faint; and has sense of uneasiness in the epigastrium; urine from nineteen to twenty ounces daily. 19th, More dyspnœa last night; œdema of scrotum increased; cough continues; urine scanty. To take gtt. i. of croton oil, and two grains of hyoseyamus to be repeated. 24th, Has had drastic purgatives, (calaterine and gamboge), which produced several watery stools, which were followed by a considerable diminution of œdema of scrotum and legs. 25th, A short time after noon, the dyspnœa became suddenly much increased, the lips became livid, the pulse feeble, and he died during the night.

*Sectio Cadaveris.*—Eighteen ounces of serum in the cavity of the abdomen; fifty-two ounces in the two sides of chest; and eight ounces in the cavity of the pericardium; heart considerably increased in size; right side of heart full of blood, chiefly fluid; right auricle considerably distended, without diminution of the thickness of its walls; right ventricle rather larger than usual; its walls somewhat increased in thickness, and much firmer than usual; left ventricle considerably dilated, without any increased thickness of its walls; mitral valve healthy. Two of the semilunar valves were elongated, and when thrown inwards, projected downwards into the upper part of the ventricle, and thus lay on a lower plane than the third valve, rendering them inadequate when tested by water. On the posterior and left side of the aorta, immediately above the semilunar valve, there was an aneurismatic swelling about the size of an orange, which projected backwards, and pressed upon the left auricle; and also partly lay on the right side of the aorta. On slitting up the pulmonary artery, a ragged transverse fissure was observed in the coats of the pulmonary artery 1 inch and 3-10ths in length, and commencing  $1\frac{1}{2}$  inch above the origin of the vessel from the right ventricle. This fissure formed a communication between the aneurismatic sac and the pulmonary artery. The coats of the aorta were thickened and

irregular on the inner surface. Liver rather larger than usual, and granulated on the surface; and the cut surfaces presented a highly mottled appearance. The kidneys were slightly mottled by yellow deposit in the cortical portion; stomach much congested in the splenic extremity. Brain healthy.

From the appearance of the communication between the aneurism and the pulmonary artery in this case forming a narrow ragged fissure, it is probable that the pulmonary artery had given way a few hours before death; and at this time the dyspnœa had become suddenly increased, with augmented lividity of the face.

CASE III.—*Aneurism of the Aorta communicating with the Pulmonary Artery.*—G. F. aged 60, was brought in a moribund state into the Clinical Ward under the charge of Professor Graham, and died shortly after admission. No accurate account of the previous history of this patient could be obtained; but it appears that he had been seen by a physician in his own house a month before he was brought to the infirmary; and he then evidently laboured under hypertrophy of the left side of heart, and had considerable dyspnœa.

*Sectio Cadaveris 36 hours after death.*—Some serous effusion in the cavity of the pericardium. The right side of heart was distended with clots of blood, chiefly decolorized. The cavity of the left ventricle was considerably enlarged, with hypertrophy of its walls, and its apex projected an inch at least beyond that of the right ventricle. The lips of the mitral valve contained some thickened and hard spots at their fixed margins; but they were not shortened, and the auriculo-ventriculo opening was not dilated. Several soft irregular warty excrescences adhered to part of the inner surface of the posterior and left semilunar aortic valves, and prevented their close approximation, though the valves themselves were not shortened. A few small warty excrescences were also attached to the aortic tendinous ring, immediately below the fixed margins of the semilunar valves. The ascending portion of the arch of the aorta was somewhat dilated, and presented numerous yellowish and slightly elevated spots on its inner surface. The part of the aorta from which the brachio-cephalic arteries arose, was nearly of its usual size, while it became suddenly dilated to about three times its usual calibre immediately beyond the origin of the left subclavian, and again assumed its natural size about an inch above the point where it passes behind the diaphragm. From the upper and right side of this dilated part of the descending portion of the arch, small infundibuliform aneurismatic pouch, rather more than an inch in length, projected forwards and to the

right side, and connected itself to the left branch of the pulmonary artery, about a quarter of an inch beyond the bifurcation of the pulmonary artery into its left and right branches, so as to form a communication between the upper part of the dilatation and the left pulmonary artery. This infundibuliform aneurismatic pouch, at the part where it communicated with the dilated portion of the aorta, would have contained the point of the thumb, while the part which opened into the left pulmonary artery was not larger than the carotid or subclavian. The orifice of the opening into the left pulmonary was somewhat rounded, but at the same time irregular and fringed at the edges. The inner surface of the pulmonary artery presented several yellow spots in the immediate neighbourhood of this opening; and there was a small number of similar spots, but more scattered, placed a little above the pulmonary semilunar valves. At the upper part of the dilated portion of the descending aorta, the coats of the vessels were but little altered from their healthy appearance; but there were several yellow and calcareous deposits on the inner surface of the middle part. The lower lobes of both lungs presented each a circumscribed dense portion somewhat less than a pigeon's egg, (pulmonary apoplexy :) they were of a dark-red colour, and one of them contained a little puriform matter in its centre. Another dense portion nearly of the same size as those just described was found in the upper lobe of left lung, and was of a light brownish yellow colour. The liver was very pale, and somewhat resembled the fatty liver in its appearance; slight yellow granular deposit in the cortical structure of the kidneys. The spleen was larger and considerably firmer than usual.

The communication between the aorta and pulmonary artery in this case, exactly occupied the position of the *ductus arteriosus* in the foetus. We believe, however, that the communication did not arise from the *ductus arteriosus* continuing pervious, from the circumstance that there was an aneurismatic dilatation of the aorta present at the point of communication; and the opening into the pulmonary artery was irregular and ragged, and did not present the smooth and rounded orifice of one artery branching off from the trunk of another. It may be difficult to decide whether this communication was or was not formed by the *ductus arteriosus* opened up, and somewhat altered by the presence of an aneurismatic dilatation on the aorta; but there can be no doubt that it lay exactly in the position of the impervious cord left in the adult by the obliteration of that vessel.

The parts exhibiting the three aneurisms of the aorta, and the parts into which they burst, detailed in the previous cases, as well as an other case, which also occurred in the Infirmary, of an aneurism of the aorta communicating with the pulmonary artery by two pret-



ty large openings, related by Dr Henderson in No. 127 of this Journal, are preserved in the University Anatomical Museum.

CASE IV.—*Aneurism of the Aorta bursting externally.*—J. P. aged 31, a mason, of temperate habits, was admitted, 7th August 1839, under the charge of Dr Shortt. Stated that, about six years ago, he began to complain of pain behind the upper part of sternum; that about twelve months after this, a tumour about the size of a nut presented itself near the sternal end of right clavicle; and that he has been occasionally troubled with dyspnœa, but not with palpitation. On admission there was a pulsating tumour, rising and falling with the systole and diastole of the heart, placed at the junction of the right clavicle with the sternum. The tumour was of a pyriform shape, projected about three inches in front of the sternum, and was about three inches and a-half in circumference. There was a loud bruit heard over the tumour, and a bruit also accompanied the sounds of the heart. Impulse of the heart strong, and felt below the sixth rib; complained of some pain in the region of the tumour. Of an athletic form of body, and general health good. Pulse 72, full and throbbing; no dyspnœa when quiescent, and appetite good; was ordered to be bled, and to take digitalis and colchicum. The tumour continued to increase in circumference, and there projected from its anterior surface a smaller tumour, measuring about three inches in circumference, and was prolonged outwards two inches beyond the surface of the broader tumour placed below. The pulsation was less strongly felt in the projecting portion than in the broad part of the tumour, but the skin covering the apex of it became first livid, and then of a dark-colour, and presented the appearance of incipient sloughing. On the 3d of September some oozing of blood took place from the apex of the projecting part. On the following day about two ounces escaped; and on the afternoon of the 4th, a sudden rush of arterial blood took place when he was straining at stool, and he soon ceased to breathe. The heart continued to beat for a few minutes after the respiration had ceased, and about four pounds of blood (to judge by the eye) had escaped.

*Sectio Cadaveris, 6th.*—On opening the thorax, a large aneurismatic dilatation was found in the anterior mediastinum. This dilatation was formed by the aorta, and included all that part of the vessel placed between its origin from the heart, and where it lies on the fourth vertebra. The most dilated part was near the origin of the *arteria innominata*, and would readily have contained two fists. The walls of this dilatation were every where formed by the coats of the artery, except at the part behind and to the right side of the sternum. The middle coat of the artery was much thickened, and contained several calcareous plates at different parts. There was a rounded opening in the walls of the sac,

which passed partly through a notch in the upper and right side of the sternum, and partly through the interval between the sternum, first rib, and clavicle. This opening admitted the passage of three fingers, and communicated with the aneurismatic tumour, which had appeared externally. The walls of the external tumour were formed by the anterior surface of the sternum, which was bare and rough, by cellular tissue, and by the skin. A firm fibrinous and decolorized clot, about a quarter of an inch in thickness, occupied the apex of the external tumour, and by the edges of this the blood had escaped. The internal tumour was partly occupied by a large soft dark-coloured coagulum. The left ventricle of the heart was very considerably dilated and hypertrophied. The semilunar aortic valves were shortened, thickened along their margins, and were inadequate. Lungs contained some serum, and were not particularly pale, some coagulated blood in heart. Liver and intestines pale; kidneys slightly granular.

This aneurism, though large, produced no dyspnoea under moderate exertion, and no dysphagia, from the circumstance that it projected forwards and not backwards. It is much rarer for aneurisms of the aorta to burst externally than what we would at first imagine. Some of the most experienced practitioners in this city have not witnessed such a case.

*CASE V.—Case of Diaphragmatic Hernia produced by a penetrating wound.*—W. R. aged 45, a shoemaker, was admitted, on the 13th September 1838, into the Infirmary, under the charge of Dr Shortt, about noon. He stated that he had been seized about 4 o'clock P.M. of the previous day with vomiting, succeeded by dyspnoea, and that the latter had continued to increase up to the time of his admission. He also stated, that for upwards of a year, he had been subject to occasional severe pain in the left hypochondriacal region, and also to cough without any expectoration. On admission he complained of great pain in the left hypochondrium, severe dyspnoea, with a depressed anxious expression of countenance; the pulse was intermittent, and so weak that it could not be reckoned. Extremities cold, and lips livid; percussion dull over the whole of the left side of the chest, and the respiratory murmur was there inaudible, while it was puerile on the right side. The sounds of the heart were only audible under the cartilages of the fourth, fifth, and sixth ribs on the right side. Had wine ordered, and sinapisms were applied to the chest and feet. Died in four hours after admission.\*

*Sectio Cadaveris, 16th September.*—Heart healthy, but somewhat displaced towards the right side. Right lung sound. The

\* The above account of his symptoms on admission was furnished by Dr Alexander Wood.

left side of the chest contained more than six pounds of a reddish fluid, but there was no recent effused lymph on the pleura. The left lung was compressed towards the spine, and also towards the edge of the cordiform tendon of the diaphragm to which it adhered; and the left side of the diaphragm was pushed downwards into the abdomen. The lung itself was devoid of air. A dark soft mass was seen lying in the lower part of this side of chest, and was connected with the upper surface of the diaphragm. On examining the upper part of the abdomen, and the lower surface of the diaphragm, it was obvious that the dark mass observed in the chest was composed of a part of the transverse arch of the colon, and a considerable mass of the large omentum, which had passed through an opening with callous edges, in the diaphragm, and become strangulated. The parts were now carefully examined *in situ*. A cicatrix nearly half an inch in length was observed in the skin at the lower part of left side of chest, midway between the anterior and posterior extremities of the ribs; and, on dissecting off the skin, a similar cicatrix was found in the ninth and tenth intercostal space, exactly opposite to that in the skin. The same cicatrix was distinctly seen on looking at the inner surface of the chest, and a process of that part of the large omentum which had accompanied the transverse arch of the colon through the diaphragm, not only adhered to the edge of the cicatrix, but was incorporated with it, and projected into the intercostal space. The aperture in the diaphragm would have admitted the passage of the points of three fingers with difficulty, and was filled up by the protruding and returning portions of the transverse arch of the colon, and was situated between the last left rib and cordiform tendon of the diaphragm, and between two and three inches from the origin of the muscular fibres of the diaphragm from the last rib, and was on a line with the cicatrix in the intercostal space, but placed on a lower level when the diaphragm was depressed. On the other hand, when this muscle was pushed up, in a manner similar to what must occur, when it is in a relaxed state, or in the act of expiration, the opening in the diaphragm was then brought on a level with the cicatrix in the intercostal space, and considerably approximated to it. That part of the transverse arch of the colon which lay within the chest was at least a foot in length, was considerably dilated, and much thickened in its coats, was of a deep dark colour, was soft in several places, and at one point had given way. The two portions of the transverse arch of the colon which lay in the opening of the diaphragm were considerably constricted. The entering portion (or the portion next the *caput cæcum*) could still be drawn upwards and downwards, and the little-finger introduced into the interior of the tube could be pressed upwards, though with some little difficulty, through the opening in the

diaphragm. The returning portion of the transverse arch of the colon was connected to the margin of the opening in the diaphragm through old adhesions of the omentum.\*

It was stated by a friend of this man, who was present at the inspection, that he had received a wound about fifteen months ago, in the lower part of left side of chest with a shoemaker's knife, in a quarrel with a woman with whom he cohabited, and that she was liberated from prison after his apparent recovery. Between the time of his receiving the wound and his death, it appears that he was at two different times a patient in the Infirmary with symptoms of severe ileus, and was each time dismissed apparently cured.

Though an examination of all the circumstances connected with this case leads us to the conclusion, that the protrusion of the transverse arch of the colon into the cavity of the left pleura took place in consequence of a wound made in the diaphragm, and that this was the cause of death, yet there are various considerations, arising from the accounts given by authors of cases where a greater or less number of the abdominal viscera had passed into the thorax from a congenital deficiency in the diaphragm, which ought to be carefully weighed before we can venture to give a definite opinion in similar occurrences, as this may involve most important consequences. Doubts will, and ought, under such circumstances, to exercise an amount of influence on our decisions, which we might not be disposed to allow them in ordinary cases. The fact, that the omentum not only adhered to the edges of the cicatrix of the wound observed on the inner surface of the thorax, but was also incorporated with it, and projected into the intercostal space, is sufficient to prove, that the omentum was present in the left side of the chest during the time that the wound was healing; but it is not of itself sufficient to decide the question which may be raised, as to the possibility of the passage of the intestine into the chest at some period previous to the infliction of the wound.

1. The first consideration which naturally presents itself on examining the recorded cases of the passage of some of the abdominal viscera into the thorax from congenital deficiency of part of the diaphragm, is the circumstance, that, though a considerable number of these have been observed in infants who were either still-born, or who died within a few weeks after birth, and had oppressed breathing from the moment of birth up to their death; yet there are others where the individual lived several years, and in some cases even to an advanced age, without any suspicion having been entertained that such a displacement of the abdominal viscera existed. In some of these, however, as we shall immediately see, the respiratory function was more or less embarrassed.

\* The preparation is preserved in the University Museum.



Riverius\* relates the case of a young man, who, when slowly convalescing from intermittent fever, took an antimonial emetic from an empiric, and after ineffectual efforts to vomit, died some hours after. On dissection, the stomach was found in the right side of chest, and the lung of that side was defective. Up to the time of his death this young man had experienced no dyspnœa, had enjoyed good health up to the period of his last illness, and had served as a soldier. G. T. Weyland† has minutely detailed the case of a boy seven years of age, who had been affected with frequent vomiting from his infancy. He appeared to have no other complaint, but this from its frequency rendered his body thin and imperfectly nourished. He was not observed to have any difficulty of breathing, even when playing with his companions. When he was seven years of age the vomiting became so frequent, accompanied by pain of head and abdomen, and his health was suffering so much, that a physician was sent for. After being subjected to treatment for about twelve days, he began slowly to recover his strength. Fourteen days after this he had a relapse after exposure to cold, and he died. On removing the sternum, the left side of the chest was seen to be filled with the folds of the intestines as high as the second rib, and the left lung was consequently much diminished in size, and devoid of air. The stomach was placed in the abdomen, was of great size, and lay in a vertical position, its pyloric extremity extending downwards to the pelvis. Dr. Monro, *Tertius*, has detailed two very interesting cases of this kind. One was a female 22 years of age, who died with symptoms of internal strangulation, and on inspection of the body, a large portion of the arch of the colon was found to have passed through a small opening in the left side of the diaphragm. She never had any difficult breathing, but was subject to pain in the lower part of left side. The other was a male of middle age, who died with cerebral symptoms, accompanied with difficult breathing and expectoration, and the arch of the colon and the omentum were found in the left side of the chest. He had an attack of ileus four months previous to his death.‡ Bartholin§ and Clauder|| relate the case of a man who had always enjoyed a free and easy respiration, except a temporary fit of asthma, but who had long laboured under vomiting and constipation, in whom the stomach, the duodenum, part of the colon and omen-

\* Opera Omnia Medica. Observ. Centuria Quarta, Obser. 67, p. 549. Lugd. 1690.

† Dissertatio Inauguralis Medica Duos Exhibens Casus Dislocationis Viscerum nonnullarum Abdominis. Jenae, 1831.

‡ Morbid Anatomy of the Gullet, Stomach, and Intestines, p. 180. 2d edition.

§ Boneti Sepulch. Anat. Tom. ii. p. 803.

|| Vide Sepulchretum, et Morgagni de Sedibus et Causis Morborum, Lib. iv. Epist. 54, §. 11

tum, had passed through a large opening with callous edges into the left side of the thorax. Petit\* details the case of a man who had colic pains and difficult breathing for forty years, and on dissection, a great portion of the colon, of the omentum, and of the splenic extremity of the stomach, had passed into the left side of the chest. The protruded parts had contracted no adhesions, and were not covered by a hernial sac. Sir Astley Cooper † relates the case of a woman, who died, when 28 years of age, with symptoms of inflammation of the abdomen of a few days standing. On dissection, about 11 inches of the transverse arch of the colon, and a great part of the omentum, had passed through an opening in the diaphragm into the left side of the chest, and the omentum adhered to the aperture in the diaphragm. Dr John Clark ‡ details the case of a man who died, when 40 years of age, with all the symptoms of peritoneal inflammation, and on dissection, a part of the transverse arch of the colon, part of the left lobe of the liver passed through an opening in the diaphragm, which he supposed to arise from congenital malformation of that muscle. This man had enjoyed good health up to the two last years of his life. As he had received a fracture of two of his ribs a year before his death, it may be argued that a rupture of the diaphragm may have occurred at that time; yet, as it is stated that he recovered from the injury without any unusual symptoms, the case may at least be adduced as additional evidence of the fact, that part of the abdominal viscera may be present in the chest without any symptom to indicate their presence. Chauvet § states, that on examining the body of a lieutenant-colonel, he found the stomach and colon in the left side of the chest. And Vetter || observed in a very old person the whole tract of the small intestines lying in the left side of the chest. ¶ Along with the above cases we may also include other three, in which part of the abdominal viscera appear to have protruded upwards into the thorax through the interval which naturally exists between the outer edges of the muscular fibres of the diaphragm which arise from the ensiform cartilage of the sternum, and those which arise from the cartilages of the ribs. One of these is related by Morgagni.\*\* It occurred in a man about 50 years of age, who died from a fracture of the skull, and the

\* *Malades Chirurgicales*, Tom. ii. p. 161. 1783.

† *Medical Records and Researches*. London, 1798.

‡ *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, Vol. ii. p. 118.

§ *Histoire de l'Academie Royale des Sciences de Paris* for 1729, p. 14.

|| *Aphorismen aus der Pathologischen Anatomie*, S. 144, as quoted by Weyland.

¶ Chauvet says nothing about the state of the respiratory and digestive organs during life in the case which he relates; and Weyland does not inform us whether the previous history of the case by Vetter was ascertained.

\*\* *De Sedibus et Causis Morborum*, Lib. iv. *Epistol.* 54, §. 11.

protruding part was the colon. A second case is related by Sir Astley Cooper,\* on the authority of Mr Bowles, and in this the right extremity of the stomach, the beginning of the duodenum, and part of the omentum, protruded into the right side of the chest, and were covered by a hernial sac formed by the peritoneum and the pleura. This man was also 50 years of age, and subject to asthmatic attacks, and died from excessive vomiting, after the exhibition of an emetic, as occurred in the case related by Riverius.† Another case, where the diaphragmatic hernia protruded through the interval on the right margin of the fibres arising from the ensiform cartilage, is related by Professor Bignardi.‡

After a knowledge of the above cases, it could not be argued that, if the protrusion of the transverse arch of the colon, in the case we have detailed, had arisen from congenital deficiency in the diaphragm, it must have manifested itself before the reception of the wound, by some embarrassment of the respiratory function. The fact, moreover, that this protrusion must have existed from the time of the infliction of the wound up to his death, without any marked impediment to the respiration, is obviously quite sufficient to invalidate any similar argument.

2. In the case we have related the protrusion of the colon through the diaphragm had occurred on the side of the chest, in which it is generally found in cases of deficient formation of the diaphragm. Of twenty-four recorded cases (not including the three last referred to,) which I have examined for this purpose, I find that in three only had the protrusion happened on the right side. One of these is the case of Riverius, already referred to; another is one of the two cases mentioned by Dr Macaulay,§ and one by Bonn.||

3. The congenital deficiencies in the left side of the diaphragm, not only vary in extent, but also in position. In several of the recorded cases, the deficiency appears to have included the whole of the left side of the diaphragm, and in others it is merely stated that the opening was on the left side. In two cases the opening was placed in the cordiform tendon, (case of Petit, and one of the cases of Weyland); in one it was stated to have been near the opening for the *cava ascendens*, (one of Vetter's cases); in

\* Opus cit. p. 14.

† Petit (opus cit.) relates the case of a man long subject to dyspnœa, and who had been treated for asthma, in whom the stomach, the colon, and the omentum were pushed up into the left side of the chest, and were enclosed in a sac formed by the diaphragm, peritoneum, and the pleura. See also Beclard's *Supplément au Traité de Searpa*, p. 132, for two cases where the sac was formed by the pleura and peritoneum.

‡ Sull' ernia diaphragmatica, 1827, as quoted by Laurence.

§ Medical Observations and Inquiries, Vol. i. p. 26, London, 1763.

|| Descriptio Thesauri Ossium Morbosorum Hoviani, No. 204, p. 69, as quoted by Laurence.

one the protrusion is said to have occurred through the opening for the sympathetic nerve, (Platner's Disput. De Hydrocel, as quoted by Morgagni); in three the protrusion occurred through the œsophageal opening (Resigius de Ventriculi in Cavo Thoracis Situ Congenito, Berlin, 1823); a case by Fantoni, as quoted by Monro, and a case by Clauder; in one it was placed an inch to the left of the œsophageal opening, (one of Dr Macaulay's cases); in one, it was placed three inches to the left of the œsophagus, (case of Sir A. Cooper); in one, in the middle of the left portion of the diaphragm, (one of Monro's cases); and in one (supposing it to be a case of congenital hernia) it must have occupied nearly the same situation as in the case we have described, since it is stated to have been situated "about three inches from the ribs, and placed more anteriorly than the œsophagus."

4. In at least two of the recorded cases, the protruding parts were firmly adherent to the edges of the opening, (cases of Sir A. Cooper and Chauvet).<sup>\*</sup> We would certainly expect that in cases of wound of the diaphragm, that if the person survived, inflammation of the edges of the divided muscle would occur, and probably cause adhesions between the edges of the wound and the parts which may have protruded into it, as in the case we have described. That lymph may be effused and unite the protruded parts to the edges of the opening in some cases of congenital deficiency of a part of the diaphragm, is *a priori* certainly quite possible, and in two cases which we have cited above it had actually occurred.

5. Some of the cases of congenital deficiency of the diaphragm terminated fatally, as in ours, by strangulation of the protruding portion of the intestines, (cases of Dr Clark, Sir A. Cooper, and Monro.)

Approaching the consideration of this case with all the caution which an examination of the recorded cases of congenital malformation of the diaphragm must naturally induce, we still feel strongly convinced that the protrusion of the colon was the consequence of a wound of the diaphragm. If we reflect upon the circumstance, that a sharp instrument could scarcely be thrust into the chest through the ninth and tenth intercostal space, where the cicatrix was found, without wounding the diaphragm, and thus necessarily at the part where the opening in it was found, if the muscle be in a relaxed state, or during expiration, as we have frequently satisfied ourselves upon the dead body; upon the great rarity of such small congenital deficiencies in the diaphragm; upon the uneasiness felt by the patient in the left hypochondrium, and thesevere attacks of ileus after the infliction of the wound; conjoined with the improbability that a person could have arrived at

<sup>\*</sup> In Sir A. Cooper's case, the omentum was the adherent part.



the age of 45 without fatal strangulation of the intestine, and have acquired an athletic form of body, when that part of the intestine passing through the opening would with difficulty admit the passage of the little finger, even when the returning portion was empty, —we can scarcely suppose that the conjunction of the opening in the diaphragm and the infliction of the wound in the parietes of the chest, were in this individual a mere coincidence. It ought not, however, to be concealed, that a more accurate account of the previous history of the patient than we are able to give would have been very desirable.

Believing that the protrusion of the intestine into the chest was in this case the consequence of a wound in the diaphragm, there are some cases on record which bear to it a greater or less resemblance; and it is of some importance to know, that the accounts given of them do not discountenance the idea we have formed of the nature of this case. Sennertus relates, in a letter to Hildanus,\* the case of a man who stabbed himself beneath the ninth left rib, and died about seven months afterwards. On dissection the stomach was found to have protruded through the cordiform tendon into the left side of the chest.† In this case the seat of the wound in the parietes of the chest, must have been placed nearer the sternum than in the one we have detailed. Ambrose Paré‡ relates the case of a person who died eight months after receiving a penetrating wound in the chest, and in whom a large portion of the colon was found in the cavity of the left pleura. This person had suffered from colic pains after the reception of the wound. Mr Boyle§ gives the case of a soldier who received a wound in the chest eleven months before his death. He died with symptoms of peritoneal inflammation, and a great part of the ileum and transverse arch of the colon had passed through an opening in the diaphragm, and became strangulated. From the time he received the wound “the respiration was affected, and even moderate exercise was supported with difficulty.” Mr Greetham|| has published a case of a muscular man, between 30 and 40 years of age, who had been wounded by a knife some years before in the left side of the chest, and who died with all the symptoms of strangulated intestine. On dissection, the omentum and a part of the colon had protruded through an opening in the cordiform tendon of the diaphragm. He had at

\* G. F. Hildani, *Medico-Chirurgi, Obser. et Curat. Chirurg. Centuriae. Cent. ii. Observ. xxxiii. 1541.*

† Vide Morgagni de *Sedibus et Causis Morborum*, Lib. iv. *Epistol. 54, §. 12* for other cases.

‡ Lib. 9, Cap. 30.

§ Vol. viii. of this *Journal*.

|| *Medical Gazette*, Vol. x. p. 43.

times severe pains in the stomach after the infliction of the wound ; but he had been able to act as a steward in a vessel during several distant voyages. The larger curvature of the stomach was drawn upwards towards the opening in the diaphragm by the omentum in the chest, so that it was nearly reversed.

Dr M'Cric\* has given an account of a preparation preserved in the Chatham Museum, obtained from a soldier who had been wounded twenty-two years before, and who died of gangrene of the lower extremities. In this case the stomach and a great part of the transverse arch of the colon had passed into the chest. After the reception of the wound up to the time of his death, he laboured under dyspeptic symptoms, and his breathing was affected on walking fast, or on ascending a hill, but these did not prevent him from acting as a sergeant in his regiment.

It would also appear that similar effects may result from laceration of the diaphragm from a fall. Dessault\* relates the case of a man who received a fall when 39 years of age, and who lived four years after this, in whom the stomach and arch of the colon had passed through an opening with callous edges into the left side of the chest. Though he was able to return to his usual employment after his recovery, he continued to complain of pain of chest and oppression of the breathing. Mr W. D. Morgan has described the history of a patient who died in the Bristol Hospital, in whom several parts of the alimentary canal were found within the left side of the chest. The opening in the diaphragm was attributed to a fall upon his back received thirty-eight years before. From the time of the injury to his death, he was able to follow his usual occupation as a mason, but had often suffered from asthmatic dyspnœa, dyspepsia and constipation.† A very remarkable case is related by Mr Taylor,§ of a man who had received many years before his death, a fall in which some of the left ribs were fractured. On dissection, a great part of the left side of the chest was filled by the stomach, and a large part of the transverse arch of the colon, yet he was able to perform the usual duties of a sailor up to his last illness, and the respiration appears to have been little affected. This man died after amputation of a leg.

\* Medical Gazette, Vol. xv. p. 872.

† Journal de Chirurgie per Dessault, Tom. iii.

‡ Medical Gazette, Vol. xii. p. 673.

§ Guy's Hospital Reports, Vol. iii. p. 366.